

Until the values of these quantities (μ , ν , q), and more especially of q , are known for very moist air, the explanation given by Tyndall of his own observations must be regarded as a very possible one, for the change of character of the reflection effect of (12) may readily occur in a sufficiently large layer, if the three coefficients (μ , ν , q) be at all appreciably modified by the presence of moisture. We may note that the effect of q alone is independent of the pitch.

On the Nature of the Streamers in the Electric Spark.

By S. R. MILNER, D.Sc. (Lond.), Lecturer in Physics, the University of Sheffield.

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(Abstract.)

The main subject of the work described in the present paper consists in the examination of the streamers in the inductive spark in the monochromatic lights of the various metallic lines. It thus forms an extension of the research of Messrs. Schuster and Hemsalech,* in which the examination of the streamers was restricted to the inductionless spark. The observations were taken by photographing the spectrum as drawn out by a rotating mirror, the slit of the spectroscope being removed and replaced by the spark itself, so that each line of the spectrum formed a monochromatic image of the spark. In order to avoid the superposition of the series of streamers which are formed in the drawing out of each monochromatic image, an arrangement of the prisms of the spectroscope was used by which, while the images of the spark on the camera screen were vertical, and drawn out in a horizontal direction, the dispersion of the spectrum was in a direction of 45° to the horizontal. By this arrangement the series of streamers corresponding to each metallic line becomes distinctly separated from the others.

Photographs of the streamers in the spectra of the sparks from the following metallic poles were taken, in each case with a number of different inductances in series with the spark: aluminium, antimony, bismuth, cadmium, calcium, copper, lead, magnesium, mercury, nickel, platinum,

* 'Phil. Trans.,' A, vol. 193, p. 189 (1900).

sodium, tin. The chief conclusions which are drawn from the research are as follows :—

(1) The streamers in the inductive spark consist of metallic vapour, the atoms of which are charged, and the motion of the vapour towards the centre of the spark gap is mainly due to the action of the electric force of the spark on the charged atoms. The chief evidence in support of this consists in a number of photographs in which the streamers move back again towards the poles as the oscillating electric field of the spark reverses its direction.

(2) Very great differences were found in the appearances of the streamers which correspond to the different lines of the same metal. The streamers may be divided in this respect into three classes, between which there is in most sparks a sharp distinction :—

(a) Blurred streamers, which are often partly masked by the whole spark gap being filled with their light. These invariably correspond to lines prominent in the arc. (b) Sharply-defined streamers, which appear throughout the whole time during which the electrical discharge lasts. These correspond to pure spark lines, *i.e.*, lines which are not present in the arc under ordinary conditions. (c) A third class of streamers show very brightly at the first oscillation, but fade away so rapidly that they appear for only one or two oscillations, even when the other lines, initially no brighter, show 10 or 12. These lines are very sensitive to the influence of self-induction in the circuit; they are very bright in the condensed spark without inductance, but disappear from the spectrum altogether when a moderate inductance is inserted.

By studying the duration of the lines in the inductionless spark, the difference between the three classes of streamers is found to be solely a question of the duration of the luminosities of the metallic lines to which they correspond, the arc lines having a long, the spark lines a short, and the “condensed spark” lines a very short, duration.

(3) No other difference than this one of the durations of the lines has been discovered in the character of the streamers. The photographs obtained show clearly that the velocities of the streamers corresponding to the different lines in the same spark are the same, in spite of the different character of the streamers.
